

Docket No. 9792909-4032
(P98,2198)

RECEIVED
PATENT
JUL 27 2001
TECHNOLOGY CENTER 2800

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re U.S. Patent Application of:)
Kenji Ohsawa et al.)
Serial No.: 09/199,305) Examiner: L. Thai
Filed: November 25, 1998) Group Art Unit: 2811
For: A SEMICONDUCTOR DEVICE AND)
AN ELECTRICAL DEVICE USING)
THE SEMICONDUCTOR DEVICE)

21/D
FJONES
7-30-01

AMENDMENT "D"

Assistant Commissioner for Patents
Washington, DC 20231

Dear Sir:

In response to the Office Action mailed March 14, 2001, please consider the following amendments and remarks. Enclosed is a Petition for a one month Extension of Time, so that the period for response now runs to and includes Monday, July 16, 2001.

In the claims:

Please amend claims 1, 11 and 15 as follows:

1. (amended) A semiconductor device comprising:
- a plurality of wiring films formed on a front surface of a base comprising an insulating resin and having electrode-forming holes with a diameter of 22 mm or less, the surfaces of the wiring films and the surface of the base being positioned on the same plane and at least parts of the wiring films overlapping with the electrode-forming holes;
 - a conductive material embedded into the electrode-forming holes to form external electrodes on the back surface, away from the wiring films, of the base;

D

1
D
cont

a semiconductor element positioned on said front surface of the base with an insulating film therebetween, the back surface of the semiconductor element being bonded to said front surface of the base; and

wire for bonding the electrodes of the semiconductor element to the corresponding wiring films.

2
D

11. (amended) An electronic device comprising a semiconductor device comprising: a plurality of wiring films formed on a front surface of a base comprising an insulating resin and having electrode-forming holes with a diameter of 22 mm or less, the surfaces of the wiring films and the surface of the base being positioned on the same plane and at least parts of the wiring films overlapping with the electrode-forming holes; a conductive material embedded into the electrode-forming holes to form external electrodes on the back surface, away from the wiring films, of the base; a semiconductor element positioned on said a front surface of the base with an insulating film therebetween, the back surface of the semiconductor element being bonded to said front surface of the base; and wires for bonding the electrodes of the semiconductor element to the corresponding wiring films.

3
D

15. (twice amended) A semiconductor device comprising:
a plurality of wiring films formed on a front surface of a base comprising an insulating resin and having electrode-forming holes with a diameter of 22 mm or less, the surfaces of the wiring films and the surface of the base being positioned on the same plane and at least parts of the wiring films overlapping with the electrode-forming holes;

a conductive material embedded into the electrode-forming holes to form external electrodes on the back surface, away from the wiring films, of the base;

a semiconductor element positioned on said front surface of the base with an insulating film therebetween, the back surface of the semiconductor element being bonded to said front surface of the base; and

wires for bonding the electrodes of the semiconductor element to the corresponding wiring films, the wiring films being formed by a layer of copper covered by a nickel layer so that the wires are bonded to the nickel layer.

Attached hereto is a marked-up version of the changes made to the claims by the current amendments. The attachment is captioned, "Version with markings to show changes made."

REMARKS

Applicants claim novel semiconductor devices (claims 1-5 and 15) and novel electronic devices employing such semiconductor devices (claims 11-14) where the semiconductor devices include a plurality of wiring films formed on a front surface of a base made of an insulating resin and having electrode-forming holes. The surfaces of the wiring films and the surface of the base are positioned on the same plane and at least parts of the wiring films overlap the electrode-forming holes. A conductive material is embedded into the electrode-forming holes to form external electrodes on the back surface, away from the wiring films. A semiconductor element is positioned on the front surface of the base with an insulating film disposed between the semiconductor element and the base. The back surface of the semiconductor element is bonded to the front surface of the base and the electrodes of the semiconductor element are bonded by wire to the corresponding wiring films.

As amended, applicants claim those embodiments of their invention where the diameter of the electrode forming holes is 22 μ m or less. Support for this amendment is found, *inter alia*, at page 5 lines , 21-23, of the specification. It is possible to produce such fine holes using a novel process also described in the specification. In particular, since the electrode-forming holes are formed by patterning of the insulating resin on a metal substrate, the fineness of the electrode-forming holes is achieved. Thus, the diameter of the electrode-forming holes is reduced to 0.22 or less, whereas the lower limit of the diameter is 0.25 mm for conventional flexible printed circuit-type or 0.35 mm for rigid substrate-type chip size packages. This increased fineness of the electrode-forming holes provides for an increase in the array density of the holes. Moreover, the electrode forming holes can be formed by patterning the insulating resin with a reduced working load and increased productivity compared with the formation of electrode-forming holes by drilling as in the rigid substrate-type. (Specification, page 5, line 19 - page 6, line 6.)

The examiner rejected independent claim 1, its dependent claim 2, independent claim 11, and its dependent claim 12 under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 5,976,912 (the Fukutomi *et al.* patent). Reconsideration is respectfully requested. The Fukutomi *et al.* patent does not disclose every limitation of the claimed invention, either explicitly or inherently.

The Fukutomi *et al.* patent does not disclose semiconductor devices having electrode-forming holes with a diameter of to 0.22 mm or less.

Furthermore, the process for making the electrode-forming holes described in the Fukutomi *et al.* patent is different than the process described in applicants' specification. For example, in preparing the semiconductor devices shown in Fig.'s 24 and 25 the electrode-forming holes are formed using an excimer laser. (Col. 25, lines 44-46.) Alternatively, the Fukutomi *et al.* patent teaches that the holes can be formed by drilling or punching. (Col. 25, lines 48-52.) Such methods do not inherently produce holes having a diameter of to 0.22 or less. Therefore, the Fukutomi *et al.* patent does not anticipate claims 1, 2, 11 or 12, so that the rejection of these claims under 35 U.S.C. § 102(e) should be withdrawn.

The examiner rejected claim 3 (the dependent claim that includes a metal ring bonded on the front surface of the base at the exterior of the connecting sections with wires in the wiring films) under 35 U.S.C. § 103(a) as obvious in light of a combination of the Fukutomi *et al.* patent and U.S. Patent No. 5,859,475 (the Freyman *et al.* patent). Reconsideration is respectfully requested. Nothing in the proposed combination of patents would have suggested semiconductor devices that include a plurality of wiring films formed on a front surface of a base having electrode-forming holes with a diameter of 0.22 mm or less, where the surfaces of the wiring films and the surface of the base are positioned on the same plane.

The Freyman *et al.* patent is cited merely because it allegedly discloses a metal ring 31 bonded on the front surface of a base 201. However, nothing in the Freyman *et al.* patent, whether considered alone or in a combination of the Fukutomi *et al.* patent and the Freyman *et al.* patent, would have suggested a plurality of wiring films formed on a front surface of a base having electrode-forming holes with a diameter of 0.22 mm or less, where the surfaces of the wiring films and the surface of the base are positioned on the same plane.

The examiner rejected claims 4 and 13 (the dependent claims covering embodiments where the wires are covered with a reinforcement having a downward indented face) under 35 U.S.C. § 103(a) as obvious in light of a combination of the Fukutomi *et al.* patent and U.S. Patent No. 5,909,057 (the McCormick *et al.* patent). Reconsideration is respectfully requested. Nothing in the proposed combination of patents would have suggested semiconductor devices that include a plurality of wiring films formed on a front surface of a base having electrode-forming holes with a diameter of 0.22 mm or less, where the surfaces of the wiring films and the surface of the base are positioned on the same plane.

The McCormick *et al.* patent is cited merely because it allegedly teaches a reinforcement 214 having a downward indented face covering the semiconductor element 200. However, nothing in the McCormick *et al.* patent, whether considered alone or considered in combination with the Fukutomi *et al.* patent, would have suggested a plurality of wiring films formed on a front surface of a base having electrode-forming holes with a diameter of 0.22 mm or less, where the surfaces of the wiring films and the surface of the base are positioned on the same plane. Therefore, the rejection of claims 4 and 13 as obvious in light of a combination of the Fukutomi *et al.* and McCormick *et al.* patents should be withdrawn.

The examiner rejected claim 5 (the dependent claim where the base has vent holes) under 35 U.S.C. § 103(a) as obvious in light of a combination of the Fukutomi *et al.* patent and U.S. Patent No. 5,708,567 (the Shim *et al.* patent). Reconsideration is respectfully requested. Nothing in the proposed combination of patents would have suggested semiconductor devices that include a plurality of wiring films formed on a front surface of a base having electrode-forming holes with a diameter of 0.22 mm or less, where the surfaces of the wiring films and the surface of the base are positioned on the same plane.

The Shim *et al.* patent is cited merely because it allegedly teaches a base 20 having vent holes 23. However, nothing in the Shim *et al.* patent, whether considered alone or considered in combination with the Fukutomi *et al.* patent, would have suggested a plurality of wiring films formed on a front surface of a base having electrode-forming holes with a diameter of 0.22 mm or less, where the surfaces of the wiring films and the surface of the base are positioned on the same plane. Therefore, the rejection of claim 5 as obvious in light of a combination of the Fukutomi *et al.* and Shim *et al.* patents should be withdrawn.

The examiner rejected claims 14 and 15 (claims covering embodiments where the wiring films comprise two layers with a layer of nickel covering the layer of copper so that the wires are connected to the nickel layer and where the wiring films are formed by a layer of copper covered by a nickel layer so that the wires are bonded to the nickel layer, respectively) under 35 U.S.C. § 103(a) as obvious in light of the Fukutomi *et al.* patent. Reconsideration is respectfully requested. Nothing in the Fukutomi *et al.* would have suggested semiconductor devices that include a base having electrode-forming holes with a diameter of 0.22 mm or less. Nothing in Fukutomi *et al.* would have suggested that a premium should be placed on fine electrode-forming holes, so nothing in Fukutomi *et al.* would have motivated one skilled in the art to manufacture semiconductor devices having electrode forming holes with a diameter of 0.22 mm

or less. Therefore, the rejection of claims 14 and 15 as obvious in light of the Fukutomi *et al.* should be withdrawn.

CONCLUSION

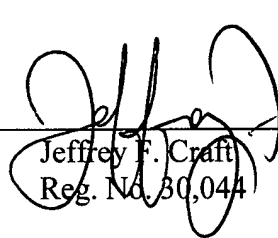
In light of the foregoing amendments and remarks, it is believed that the application is in condition for allowance and, therefore, a prompt and favorable action is solicited.

Respectfully submitted,

SONNENSCHN NATH & ROSENTHAL

July 16, 2001

By:

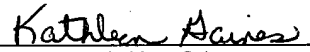

Jeffrey F. Craft
Reg. No. 30,044

SONNENSCHN NATH & ROSENTHAL
P.O. Box #061080
Wacker Drive Station
Sears Tower
Chicago, IL 60606-6404
(312)876-8000

I hereby certify that this document and any fee being referred to as attached or enclosed is being deposited with the United States Postal Service as first class mail in an envelope addressed to Assistant Commissioner for Patents, Washington, D.C. 20231, on

July 16, 2001

Date


Kathleen Gaines

30079000

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the claims:

Claim 1 has been amended as follows:

-- 1. (twice amended) A semiconductor device comprising:

a plurality of wiring films formed on a front surface of a base comprising an insulating resin and having electrode-forming holes with a diameter of 22 mm or less, the surfaces of the wiring films and the surface of the base being positioned on the same plane and at least parts of the wiring films overlapping with the electrode-forming holes;

a conductive material embedded into the electrode-forming holes to form external electrodes on the back surface, away from the wiring films, of the base;

a semiconductor element positioned on said front surface of the base with an insulating film therebetween, the back surface of the semiconductor element being bonded to said front surface of the base; and

wire for bonding the electrodes of the semiconductor element to the corresponding wiring films. --

-- 11. (twice amended) An electronic device comprising a semiconductor device comprising: a plurality of wiring films formed on a front surface of a base comprising an insulating resin and having electrode-forming holes with a diameter of 22 mm or less, the surfaces of the wiring films and the surface of the base being positioned on the same plane and at least parts of the wiring films overlapping with the electrode-forming holes; a conductive material embedded into the electrode-forming holes to form external electrodes on the back surface, away from the wiring films, of the base; a semiconductor element positioned on said a front surface of the base with an insulating film therebetween, the back surface of the semiconductor element being bonded to said front surface of the base; and wires for bonding the electrodes of the semiconductor element to the corresponding wiring films.

-- 15. (twice amended) A semiconductor device comprising:

a plurality of wiring films formed on a front surface of a base comprising an insulating resin and having electrode-forming holes with a diameter of 22 mm or less, the surfaces of the

wiring films and the surface of the base being positioned on the same plane and at least parts of the wiring films overlapping with the electrode-forming holes;

a conductive material embedded into the electrode-forming holes to form external electrodes on the back surface, away from the wiring films, of the base;

a semiconductor element positioned on said front surface of the base with an insulating film therebetween, the back surface of the semiconductor element being bonded to said front surface of the base; and

wires for bonding the electrodes of the semiconductor element to the corresponding wiring films, the wiring films being formed by a layer of copper covered by a nickel layer so that the wires are bonded to the nickel layer.--